

QUADRATIC WORD PROBLEMS

Determining Maximum and Minimum Values

Example 1

A model rocket is launched from the roof of a building. Its flight path is modeled by $h = -5t^2 + 30t + 10$ where h is the height of the rocket above the ground in metres and t is the time after the launch in seconds.



What is the rocket's maximum height?

Example 2



A rectangular field will be fenced on all four sides. There will also be a line of fence across the field, parallel to the shorter side.

If 900 m of fencing are available, what dimensions of the field will produce the maximum area? What is the maximum area?

Example 3

Tickets to a school dance cost \$4 and the projected attendance is 300 people. For every \$0.10 increase in ticket price, the dance committee projects that attendance will decrease by 5.



a) Determine the dance committee's greatest possible revenue.

b) What ticket price will produce the greatest revenue?

QUADRATIC WORD PROBLEMS

Solving Quadratic Equations

Example 1

A water balloon is catapulted into the air so that its height h , in metres, after t seconds is $h = -4.9t^2 + 27t + 2.4$

- a) How high is the balloon after 1 second?
- b) For how long is the balloon more than 30 m high?
- c) What is the maximum height of the balloon?
- d) When will the balloon burst as it hits the ground?



Example 2



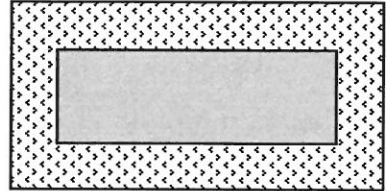
Nancy walks 15 m diagonally across a rectangular field. She then returns to her starting position along the outside of the field. The total distance she walks is 36 m. What are the dimensions of the field?

QUADRATIC WORD PROBLEMS

Solving Quadratic Equations

Example 1

A rectangular lawn measuring 8 m by 4 m is surrounded by a flower bed of uniform width. The combined area of the lawn and the flower bed is 165 m^2 . What is the width of the flower bed?



General Strategies

- Read the problem entirely. Don't be afraid to re-read it until you understand.
- Determine what you are asked to find.
 - If it requires finding a maximum or minimum, then complete the square.
 - If it requires solving a quadratic equation, then factor or use the quadratic formula.
- Draw and label a diagram when applicable.
- Define all variables you introduce.
- Look at your answer and ask yourself: "Is this answer possible?" You may find that your answer is not possible because it does not fit with the facts presented in the problem.
- Finish your solution with a concluding statement.

Determining Maximum and Minimum Values

1. A rectangular field is to be enclosed by 400 m of fence. What is the maximum area? What dimensions will give the maximum area?
(Answer: 10000 m², 100 m by 100 m)
2. Last year, talent show tickets were sold for \$11 each and 400 people attended. It has been determined that an increase of \$1 in ticket price would cause a decrease in attendance of 20 people. What ticket price would maximize revenue?
(Answer: \$15.50)

Solving Quadratic Equations

3. The sum of the squares of two consecutive even integers is 452. Find the integers.
(Answer: 14, 16 or -14, 16)
4. The width of a rectangle is 2 m less than the length. The area is 48 m². Find the dimensions.
(Answer: 6 m by 8 m)
5. One side of a right triangle is 2 cm shorter than the hypotenuse and 7 cm longer than the third side. Find the lengths of the sides of the triangle.
(Answer: 8 cm, 15 cm, 17 cm)

6. A uniform border on a framed photograph has the same area as the photograph. What are the outside dimensions of the border if the dimensions of the photograph are 25 cm by 20 cm?
(Answer: 34.2 cm by 29.2 cm)
7. A sheet of cardboard 10 inches by 12 inches will be made into a box by cutting equal-sized squares from each corner and folding up the four edges. If the area of the base is to be 80 square inches, then what size square should be cut from each corner?
(Answer: 1 inch by 1 inch)

Multi-Part Questions

8. A football is punted into the air. Its height h , in metres, after t seconds is given by the equation $h = -4.9t^2 + 24.5t + 1$.
- a) How high is the ball after 1 second?
(Answer: 20.6 m)
- b) Find the maximum height of the ball to one decimal place.
(Answer: 31.6 m)
- c) When does the ball reach its maximum height?
(Answer: 2.5 s)
- d) When does the ball hit the ground?
(5.04 seconds)